Missouri Pre-K Science Standards

Missouri Department of Elementary and Secondary Education • Early Childhood Section

Introduction

The standards are broad descriptions of what most children should know and be able to do by the time they enter kindergarten. They are not a curriculum but a framework for communicating a shared set of expectations for preschool children in the field of science.

We realize some children will far exceed these standards; others will not enter kindergarten with the knowledge and experiences suggested in this document. Just as we recognize that different people bring different things to our society, we also recognize that variability in children is normal. The standards are not intended to be used to determine whether a child "is ready" to enter kindergarten. The standards are, however, goals for adults to use in supporting the science development of preschool children. Available evidence indicates that the standards are appropriate for most children.

The standards were developed by a broad-based group of individuals whose backgrounds are representative of many facets of the early childhood community in Missouri. The standards are intended to be used in a variety of early childhood settings by a variety of people — parents, parent educators, child-care providers, Head Start and public/private school teachers, etc. They are consistent with current research and recommendations from other state and national initiatives.

It is our hope that the ultimate beneficiaries of this work will be our children, resulting in all children entering school ready to succeed.

Missouri Pre-K Guiding Principles

1. All children actively seek to comprehend the world in which they live. Given the opportunity to make choices concerning their activities, they acquire knowledge, skills and the ability to solve problems.

2. Children construct knowledge and values through interactions with peers, parents and other adults and through active exploration of the physical and social environment.

3. Young children's thinking contains predictable errors.

4. Early learning and areas of development interact and influence each other.

5. Families (parents) are the child's first and most important teachers.

6. Children exhibit individual differences in their development of competencies.

Missouri Pre-K Standards for Science

Content Component	Process Standards
Physical science	Explores physical properties of objects and materials Investigates properties of objects and materials Solves problems involving physical properties of objects and materials Represents observations of the physical world in a variety of ways
Life science	Explores characteristics of living things Investigates characteristics of living things Solves problems related to living things Represents observations about living things in a variety of ways
Earth and space	Explores properties of earth and space Investigates properties of earth and space Solves problems involving earth and space Represents observations about earth and space in a variety of ways

Process Standards .....Competencies in the process of science.

Indicators.....Milestones toward the development of competencies.

Examples.....Observable behaviors children may exhibit in their science development.

Guiding Principles .....Principles of child development that guide Missouri early childhood practices.

Physical science

Explores physical properties of objects and materials.

Indicator	Examples
1. Shows interest in the physical world.	The child • comments on changes in the physical world (e.g., says, "We made Play-Doh out of salt, flour and water."). • looks at fiction and nonfiction books (e.g., *Mouse Paint*, *Trucks*, *Freight Train*, *Snow Balls*, *Stone Soup*, *How Things Work*) about the physical world.
2. Uses one or more senses to observe the physical world.	The child • comments on changes when substances are mixed, shaken or cooked (e.g., mixing paint, making butter from cream, cooking Play-Doh). • collects objects of different shapes and sizes (e.g., marbles, coins, blocks). • listens to and identifies environmental sounds (e.g., cars, airplanes, wind, rain, birds).
3. Experiments with simple tools.	The child • explores ramps, magnets, magnifying glasses, scales, eyedroppers, unbreakable mirrors, cups, funnels, etc.

Physical science

Investigates properties of objects and materials.

Indicator	Examples
1. Asks questions about objects and materials.	The child • asks, "Why does the ice cube melt?" • asks, "Why does this ball roll faster than that one?" • asks, "Why do magnets stick together?"
2. Experiments with objects and materials to gather information and observe reactions.	The child • plays in water with objects that sink and float. • repeatedly rolls a car down a ramp. • mixes colors using paint, watercolors, food coloring, etc.
3. Shows knowledge of physical properties of objects.	The child • sorts objects and materials by what they are made of (e.g., rock, metal, plastic, wood, glass, cloth). • sorts objects and materials by various characteristics (e.g., soft/hard, float/sink, loud/quiet). • tells (not always accurately) how ice, Play-Doh, pudding, etc., is made.

Physical Science

Solves problems involving physical properties of objects and materials.

Indicator	Examples
1. Identifies problems involving physical properties of objects and materials.	The child • says, "I want the car to go faster." • says, "I want to build a taller tower." • says, "I have red, blue and yellow paint, but I want green."
2. Experiments with objects to produce desired effects.	The child • moves the ramp to make a toy car go different speeds. • tries to make a new color of paint by mixing other paint colors. • tries to throw a ball at a target.
3. Makes predictions based on experiences with objects and materials.	The child • suggests which objects will sink or float. • guesses which ramp the car will go down faster. • predicts which objects magnets attract or repel (e.g., leaves, cotton balls, paper clips, nuts and bolts). • makes suggestions that will cause ice to melt faster.

Physical Science

Represents observations of the physical world in a variety of ways.

Indicator	Examples
1. Represents observations through pretend play.	**The child** • pretends to prepare/cook food. • uses simple tools (e.g., magnets, magnifying glasses, ramps, tape measures, balls, prisms) in pretend play. • engages in role playing (e.g., acts like a scientist, chef, construction worker, artist, race car driver/pit crew member).
2. Represents observations through music and movement.	**The child** • pretends to skate on ice. • acts out a melting snowman, popping popcorn, an object rolling down a hill. • sings action songs (e.g., *I'm a Little Teapot*, *Johnny Works With One Hammer*, *Grand Old Duke of York*, *Jack and Jill Went Up the Hill*). • creates songs about experiences in the physical world.
3. Represents observations through art and construction.	**The child** • builds and/or draws towers, enclosures, roads, bridges, tunnels, ramps and vehicles. • intentionally mixes blue and yellow paint to make green. • draws "maps" or "blueprints" of constructions.
4. Talks about the physical world.	**The child** • asks, "How did you do that?" • tells a friend, "If you add another block to the tower, it will fall." • describes objects according to size, shape, color or speed. • uses names for tools (e.g., magnifying glass, magnet, scale, ramp). • uses texture words (e.g., bumpy, rough, soft, smooth, slick, hard). • uses measurement words (e.g., heavy/light, hot/cold, big/little, long/short, fast/slow).

Life science

Explores characteristics of living things.

Indicator	Examples
1. Shows interest in plant and animal changes.	The child • comments on changes in living things (e.g., babies grow to adults, seeds become plants, caterpillars become butterflies, birds hatch from eggs). • remarks that the leaves are changing colors, the trees have buds, the flowers are blooming. • looks at books, magazines and posters that feature living things (e.g., *The Very Hungry Caterpillar*; *Ranger Rick's Your Big Back Yard*; *Zoo Book*; magazines and posters from the Missouri Department of Conservation).
2. Uses one or more senses to observe the natural world.	The child • expresses wonder/excitement about living things (e.g., rabbits, deer, fish, spiders, birds, blooming flowers). • says, "I hear the birds singing," or "The dog is barking." • says, "I smell a skunk," or "Smell this flower." • comments on the different tastes of food. • holds or watches a caterpillar or worm to see how it moves. • catches bugs and places them in a container. • uses a magnifying glass to observe living things. • examines leaves, pine cones, shells, etc.

Life science

Investigates characteristics of living things.

Indicator	Examples
1. Asks questions about the natural world.	The child • asks, "Why didn't the seed grow?" • asks, "Where do babies come from?" • asks, "Where do the frogs go in winter?" • asks, "How do fish breathe?" • asks, "What do animals eat?"
2. Collects information to learn about living things.	The child • collects leaves, pine cones, shells, seeds, bugs, etc. • uses a magnifying glass to investigate a spider web. • uses real or pretend binoculars to observe nature (e.g., birds, trees). • looks at books and magazines to learn about living things.
3. Shows knowledge of the characteristics of living things.	The child • matches mother animals with their babies using pictures, stuffed animals, animal matching games, animal figurines, etc. • sorts collections (e.g., leaves, pine cones, shells, seeds, bugs). • talks about the differences in animals (e.g., birds have feathers, fish live in water, dogs and cats have fur). • identifies living versus nonliving things (e.g., says, "That's just a plastic snake!").

Life science

Solves problems related to living things.

Indicator	Examples
1. Identifies problems involving living things.	The child • comments that the plant is drooping (wilting). • complains that the animal cage is smelly. • says, "I can't play outside because the bugs will bite."
2. Recognizes that living things have needs.	The child • says, "The plant needs water." • says, "I'm hungry." • says, "The dog wants to play."
3. Makes predictions based on experiences with living things.	The child • says, "I think a baby chick will come out of the egg." • says, "If we don't water the plant, it will die." • says, "When the dog brings the ball, he wants to play." • says, "When the baby cries, she needs you."

Life science

Represents observations about living things in a variety of ways.

Indicator	Examples
1. Represents observations through pretend play.	The child • Engages in role playing (e.g., plays a veterinarian, gardener, doctor, farmer, florist, parent). • pretends to be an animal (e.g., dog, elephant, bird).
2. Represents observations through music and movement.	The child • moves like an elephant, spider or snake. • sings songs about living things (e.g., *Six Little Ducks*, *Old MacDonald Had a Farm*, *Five Little Speckled Frogs*, *Baby Bumble Bee*, *And the Green Grass Grew All Around*, *Sweetly Sings the Donkey*). • creates songs about living things.
3. Represents observations through art and construction.	The child • draws or paints pictures of animals. • uses blocks to build a farm or zoo. • draws or paints pictures of his own family.
4. Talks about plants and animals.	The child • tells about family pets, trips to the zoo, etc. • comments on how to care for a pet. • uses words such as leaf, tree and flower in conversation. • uses names of living things (e.g., elephant, cow, bird, fish, dog, spider, insect, flower, tree, grass). • uses words such as beak, wings, skin, shell, claws, head, tail, feathers, horns and fur in conversation.

Earth and Space

Explores properties of earth and space.

Indicator	Examples
1. Shows interest in earth and space.	The child • comments on changes in the weather, clouds or seasons. • looks at books and magazines about earth and space (e.g., *In the Night Sky*; *Happy Birthday Moon*; *Goodnight Moon*; *In the Small, Small Pond*; *The Snowy Day*; *Mud Puddle*; *Let's Go Rock Collecting*; *Star Gazers*; *Ranger Rick's Your Big Back Yard*).
2. Uses one or more senses to observe earth and space.	The child • plays with, collects and examines rocks, soil (dirt), mud, sand, shells, etc. • notices shadows. • says, "I hear the rain (thunder, wind)." • looks at the clouds, the stars and the moon.
3. Uses simple tools to explore earth and space.	The child • uses a sand sifter, garden tools, etc., to explore the dirt, mud, sand and rocks. • uses a flashlight to make shadows. • plays with measuring devices (e.g., thermometer, rain gauge, ruler, cup, bowl). • experiments with windsocks, pinwheels, telescopes, binoculars, kites, magnifying glasses, etc.

Earth and Space

Investigates properties of earth and space.

Indicator	Examples
1. Asks questions about earth and space.	The child • asks, "How do you make mud?" • asks, "Why is this rock shiny?" • asks, "What makes the thunder and lightning?" • asks, "What happened to the snow?" • asks, "Why is the moon out in the daytime?" • asks, "Where does the sun go to sleep?" • asks, "Why is the moon following me?"
2. Conducts experiments to gain knowledge of earth and space.	The child • adds water to soil (dirt) to make mud. • looks for rocks that will write on concrete. • tries to change rocks (e.g., breaks them into smaller pieces or makes them shiny by using water or oil). • paints with water on outside surfaces.
3. Shows knowledge of changes in earth and space.	The child • comments on changes in the weather, clouds, temperature, daylight and darkness. • says, "The moon is different tonight." • comments on changes in puddles, grass, soil, sand, wood chips, etc.

Earth and Space

Solves problems involving earth and space.

Indicator	Examples
1. Identifies problems involving earth and space.	**The child** • says, "There is no grass under the slide." • says, "It's cold outside." • says, "I can't walk on the sidewalk (sand). It is too hot." • says, "My shoes got wet when I stepped in the puddle." • says, "I can't dig in this hard dirt."
2. Makes predictions based on experiences with earth and space.	**The child** • says, "I hear thunder. It's going to rain." • says, "We get to play outside because it is sunny." • says, "I think the snow will melt because the sun is shining." • says, "I might fall on the ice." • says, "If it snows too much, we can't go anywhere." • says, "Water and dirt make mud."

Earth and Space

Represents observations about earth and space in a variety of ways.

Indicator	Examples
1. Represents observations through pretend play.	The child • engages in role playing (e.g., plays a weather person, astronaut, farmer). • dresses dolls, puppets or flannel-board characters according to the weather. • uses simple tools (e.g., magnifying glasses, binoculars, telescopes, scales, maps, digging tools, brushes, buckets) to pretend.
2. Represents observations through music and movement.	The child • moves like the wind, snowman, snowflake, rocket, astronaut in space, tornado, dinosaur, etc. • sings songs such as *Twinkle, Twinkle, Little Star*; *The Itsy, Bitsy Spider*; *Hey Diddle Diddle*; and *If All the Raindrops Were Lemondrops and Gumdrops*. • creates songs about earth and space.
3. Represents observations through art and construction.	The child • makes landscapes with mud, sand and water. • draws or paints pictures of the sky, moon, stars, sun, earth, etc. • uses Play-Doh or blocks to make mountains, snowmen, spaceships, caves, dinosaurs, etc.
4. Talks about earth and space.	The child • describes rocks according to size, shape and color. • says, "The moon and stars come out at night." • talks about night and day. • talks about winter, spring, summer and fall. • uses earth words (e.g., soil, ocean, mountain, sand, rock, river, lake, creek). • uses weather words (e.g., rainy, windy, snowy, foggy, sunny, cloudy, temperature). • uses seasonal words (e.g., winter, spring, summer and fall). • uses space words (e.g., moon, star, sun, sky, air).

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